



1401 DATA PROCESSING SYSTEM
PROGRAM CARD

OPERATION CODE	INSTRUCTION	TRANSMISSION STOPPED BY	REQUIRED WORD MARKS	CAN INST. BE CHAINED	CONTENTS OF REGISTERS AT COMP. OF OPERATION			REMARKS
					I	A	B	
1	Read A Card				NSI	Ap	081	
2	Write A Line				NSI	Ap	335	B-Add. Reg. stands at 333 with Print Storage
2□	Write Word Marks				NSI	dbb	335	B-Add. Reg. stands at 333 with Print Storage
3	Write-Read				NSI	Ap	081	Printing occurs first
4	Punch A Card				NSI	Ap	181	
4R	Read-Punch Feed				NSI	dbb	181	
5	Read-Punch				NSI	Ap	181 or 081	Normally B-Add. Reg. is at 181 unless punching is completed first
6	Write-Punch				NSI	Ap	181	
6R	Write-Read Punch Feed				NSI	dbb	181	
7	Write-Read-Punch				NSI	Ap	181 or 081	See remarks for Read-Punch
8	Start Read Feed				NSI	Ap	Bp	
9	Start Punch Feed				NSI	Ap	Bp	
A (A) (B)	Add	B-field word mark	B-field. A-field only if smaller than B-field	Yes	NSI	A-Lw	B-LB	Blanks are treated as zeros, unsigned fields are treated as positive
S (A) (B)	Subtract	B-field word mark	B-field. A-field only if smaller than B-field	Yes	NSI	A-Lw	B-LB	Same as remark for Add
? (A) (B)	Zero and Add	B-field word mark	B-field. A-field only if smaller than B-field	Yes	NSI	A-Lw	B-LB	
! (A) (B)	Zero and Subtract	B-field word mark	B-field. A-field only if smaller than B-field	Yes	NSI	A-Lw	B-LB	Can be used with a single address to change sign of field
@ (A) (B)	Multiply		A and B-field	No	NSI	A-Lc	B-L of product field	Product in low-order positions of B-field
% (A) (B)	Divide		A-field	No	NSI	A-La	Tens pos. of quot.	Quotient is developed in high-order position of B-field
B (I)	Branch			No	NSI	Bi	Bi	The I-address can be followed by a blank without a word mark
B (I) d	Branch if Indicator On			No	NSI	Bi	dbb	
B (I) (B) d	Branch If Character Equal			Yes	NSI	Bi	B-1	The character at B-address is compared to the d-character
V (I) (B) d	Branch IF WM and/or Zone			Yes	NSI	Bi	B-1	Tests character at B for zone and/or WM
D (A) (B)	Move Numerical	Single digit move		Yes	NSI	A-1	B-1	Numeric bits of A moved to B. B zone bits are retained.
L (A) (B)	Load Characters to A-Word Mark	A-field word mark	A-field	Yes	NSI	A-La	B-La	B-field word marks are cleared
M (A) (B)	Move Characters to A- or B-Word Mark	First word mark encountered		Yes	NSI	A-Lw	Bp-Lw	
Y (A) (B)	Move Zone			Yes	NSI	A-1	B-1	Zone bits of A are moved to B. B numeric bits are retained.
Z (A) (B)	Move Characters and Suppress Zeros	A-field word mark		No	NSI	A-La	B + 1	B-field word marks are cleared
, (A) (B)	Set Word Mark			Yes	NSI	A-1	B-1	Sets word marks in A- and B-address. Data is undisturbed
□ (A) (B)	Clear Word Mark			Yes	NSI	A-1	B-1	Removes the word marks at the A and B location. Data is undisturbed
C (A) (B)	Compare	First word mark encountered	A or B-field	Yes	NSI	A-Lw	B-Lw	If B field is longer than A field unequal compare results
E (A) (B)	Move Characters and Edit	B-field word mark	A and B-field	No	NSI	A-La	B-LB	If zero suppression occurs B-Add. Reg. contains location of control zero + 1
F d	Control Carriage			No	NSI	dbb	dbb	

INTERNATIONAL BUSINESS MACHINES CORPORATION
DATA PROCESSING DIVISION
112 EAST POST ROAD WHITE PLAINS, N. Y.

630715MUP

OPERATION CODE	INSTRUCTION	TRANSMISSION STOPPED BY	REQUIRED WORD MARKS	CAN INST. BE CHAINED	CONTENTS OF REGISTERS AT COMP. OF OPERATION			REMARKS
					I	A	B	
Q (A)	Store A-Address Register			No	NSI	A-3	Ap	Stores contents of A-address register in A-address
K d	Select Stacker			No	NSI	dbb	dbb	
N	No Operation			No	NSI	Ap	Bp	Program resumes at next Op code with a WM
H (A)	Store B-Address Register			No	NSI	A-3	Bp	Stores contents of B-address register in A-address
/ (A)	Clear Storage	Stops at hundreds position of storage block involved		Yes	NSI	A	X-001	
•	Halt			No	NSI	Ap	Bp	Press start key to resume operation
# (A) (B)	Modify Address	This is a 3-position Add operation		No	NSI	A-3	B-1 or B-3	
M (% UX) (B) R	Read Tape	Inter-record gap or GM-WM in storage		No	NSI	% 4X	GM + 1	GM is inserted in storage after last character is read from tape
M (% UX) (B) W	Write Tape	GM-WM		No	NSI	% 4X	GM + 1	
L (% UX) (B) R	Read Tape with Word Marks	Inter-record gap with a GM-WM in storage		No	NSI	% 4X	GM + 1	Word separator characters are translated into WM in storage
L (% UX) (B) W	Write Tape with Word Marks	GM-WM		No	NSI	% 4X	GM + 1	WM in storage are written on tape as Word Separator Characters
M (% CX) (B) R	Read Compressed Tape	Inter-record gap		No	NSI	% 3X	B + L _{RECORD}	
P (A) (B)	Move Characters to Record Mark or GM-WM	GM-WM or record mark in A-field		Yes	NSI	A + LA	B + LA	WM are not moved or cleared
X (A) (B)	Move and Insert Zeros	GM-WM to left of high-order position of A-field	High-order position of expanded fields	No	NSI	A-field GM-WM	A-field GM-WM	
M (% F0) (B) R	Seek Disk		GM-WM in B + 8	No	NSI	B + 1	B + 8	Sends access arm to proper disk and track
M (% FX) (B) R	Read Disk	End of sector (1 or 5)	GM-WM mark in B + 8 and B + 209	No	NSI	B + 1	B + 210	Can READ 1 or 5 sectors depending on X-character in A-address
M (% FX) (B) W	Write Disk	End of sector (1 or 5)	GM-WM in B + 8 and B + 209	No	NSI	B + 1	B + 210	Can WRITE 1 or 5 sectors depending on X-character in A-address
L (% FX) (B) R	Read Disk with Word Marks	End of sector (1 or 5)	GM-WM in B + 8 and B + 185	No	NSI	B + 1	B + 186	176 characters and word marks are read from a sector
L (% FX) (B) W	Write Disk with Word Marks	End of sector (1 or 5)	GM-WM in B + 8 and B + 185	No	NSI	B + 1	B + 186	176 characters and word marks are written on a sector
M (% F3) (B) W	Write Disk Check	End of sector (1 or 5)	GM-WM in B + 8 and B + 209	No	NSI	B + 1	B + 210	A char. by char. comparison is made of the data in storage with the disk record
L (% F3) (B) W	Write Disk Check	End of sector (1 or 5)	GM-WM in B + 8 and B + 185	No	NSI	B + 1	B + 186	A char. by char. comparison is made of the data in storage with the disk record
M (% T0) (B) R	Read from Console Printer	GM-WM or pressing Clear key		No	NSI	% 30	B + LB	Inquiry Request indicator must be ON
M (% T0) (B) W	Write On Console Printer	GM-WM in core storage		No	NSI	% 30	B + LB	
L (% T0) (B) R	Read from Console Printer with WM	GM-WM or pressing Clear key		No	NSI	% 30	B + LB	Word marks are entered by pressing WM key
L (% T0) (B) W	Write On Console Printer with WM	GM-WM in core storage		No	NSI	% 30	B + LB	Characters with a WM are printed in red
M (% T0) (B) W	Line Space	GM-WM	GM-WM at B-Address	No	NSI	% 30	B + 1	

KEY TO ABBREVIATIONS

A	A-address of the instruction	LD	The number of characters in a disk record
B	B-address of the instruction	LW	The number of characters in the A- or B-field, whichever is smaller
NSI	Address of the next sequential instruction	Ap	The previous setting of the A-address register
BI	Address of the next instruction if a branch occurs	Bp	The previous setting of the B-address register
LA	The number of characters in the A-field	dbb	The d-character and blank in the units and tens positions
LB	The number of characters in the B-field	dpp	The d-character and the tens and units positions of the previous register setting
LC	The number of characters in multiplicand field	GM-WM	Group-Mark with a Word-Mark